With respect to the objection to Figure 4, old Figure 4 has herewith been replaced with a new Figure 4 wherein the designation "prior art" is included. The Examiner is thanked for pointing out this oversight by Applicants.

With respect to the objection to the use of the abbreviation "PTFE", claim 6 has been amended to spell out the full name of this compound. Additionally, Applicants have herewith amended the specification at page 4, the site of the first occurrence of the term "PTFE", so that it is indicated that PTFE is equivalent to the terms teflon and polytetrafluoroethylene.

Finally, claim 2 has been amended to overcome the objection under 37 CFR 1.75 as allegedly being a duplicate of claim 1.

It is believed that the present case is now in condition for allowance, and such action by the Examiner is earnestly solicited.

Respectfully Submitted,

Date: 5/10/02

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

1. An equilibrium dialysis apparatus comprising:

a body, comprising a top surface having a first plane and a bottom surface having a second plane, in which body is contained at least one testing well, each of which well is separated into a first side and a second side, by means for vertically separating the well, such that both of said sides of each well are fully open and accessible from the top of the body and closed on said bottom surface.

2. The apparatus of claim 1, wherein said means for vertically separating the well ~~include~~ comprises dialysis membranes.

6. The apparatus of claim 1, wherein said body of the device comprises the material polytetrafluoroethylene ~~PTFE~~.

In the Specification:

Please see pages 1 and 4 of the specification hereinafter that show the changes made.

In the Figures:

Please see replacement Figure 4 hereinafter. Replacement Figure 4 has not been marked to show the changes made. The only change made therein is the addition of the term "Prior Art".

TITLE: MICRO-EQUILIBRIUM DIALYSIS VERTICALLY-LOADED APPARATUS

INVENTORS: MICHAEL BANKER, TIMOTHY ZUZEL and JOHN WILLIAMS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Application 60/156,800 filed September 30, 1999.

FIELD OF THE INVENTION

The present invention relates to the field of equilibrium dialysis devices. More particularly, the present invention describes a micro-equilibrium dialysis apparatus utilizing any number of dialysis membranes vertically inserted through a dialysis block containing any number of sample wells, such that both the donating and receiving sides of all wells can be accessed from the top of the apparatus at any time.

BACKGROUND OF THE INVENTION

Equilibrium dialysis is a procedure for measuring the concentration of free, relatively small molecules in a sample. The procedure was originally designed to study the quantitative aspects of immunity reactions and, over the years, the procedure has been employed primarily in immunological studies. See, e.g., J. Marrack and F.C. Smith, Brit. J. Exptl. Path., 13, 394 (1932), F. Haurowitz and F. Breinl, Z. Physiol. Chem., 214, 111 (1933), H. N. Eisen and F. Karush, J. Am. Chem. Soc., 71, 363 (1949), and D. N. Weir, Editor, "Handbook of Experimental Immunology", Second Edition, Blackwell Scientific Publications, Oxford, 1973, pp. 16.1-16.21. Furthermore, equilibrium dialysis has been considered an ideal approach to study binding of small molecules or ions (ligants) to macromolecules (proteins) and such studies have been very important in many fields, including biochemistry and pharmacology.

into the dialysis block. The well-membrane bodies are preferably formed as a singular body, by any of a variety of methods such as by injection molding. In another specific embodiment, each well is divisible by a gap passing along a vertical plane perpendicular to the top and bottom planes of the block and passing through the entire depth of the well. A dialysis membrane is placed in the gap, dividing the well into two, for the sample and dialysis buffer respectively. The gap preferably is of a depth larger than the depth of any well formed and preferably of a diameter larger than that of such well so as to minimize leaking of the test substance between the two sides of the well.

The block may be made of any of a variety of shapes, sizes or materials. The material of the block is preferably a material that will minimize non-specific binding of the samples to be tested. Suitable materials include some type of PTFE (polytetrafluoroethylene or Teflon®). Any number of wells may be used. Also, wells of any depth and diameter may be formed. In one suitable implementation, the number of wells is ninety-six, arranged in an 8x12 array, of such predetermined spacing and dimensions as to make the wells accessible to and compatible with all standard 96-well format laboratory supplies and instruments. Preferably, the wells are formed by drilling holes into the dialysis block.

Preferably, the gaps in the wells through which the dialysis membrane may be placed are formed by using two or more bars to form the body of the block. The wells are typically formed so that they overlap with, and are split by, the gaps formed between adjacent bars. When the wells are formed in this manner, the planar gaps between adjacent bars which are perpendicular to the top and bottom surfaces of the block, provide gaps of necessary thickness and depth for the placement of the dialysis membrane.